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FEDERAL COMMUNICATIONS COMMISSION  
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Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, DC 20554

In the Matter of

Amendment of Parts 2 and  
90 of the Commission's  
Rules Relating to the  
Location and Monitoring  
Service in the  
902-928 MHz Band

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PR Docket No. 93-61

REPLY COMMENTS OF AMTECH CORPORATION

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## SUMMARY

AMTECH Corporation (AMTECH) hereby replies to the comments filed in response to the Commission's Notice of Proposed Rulemaking ("NPRM"), in which the agency proposes the adoption of permanent rules for the Location and Monitoring Service ("LMS" formerly termed Automatic Vehicle Monitoring or "AVM").

The opening comments convincingly support the Commission's proposal to open the entire 902-928 MHz band to AVM/LMS services. A wide variety of commenters also support the position advocated by AMTECH that the Commission afford local-area and wide-area systems access to the entire band on a shared basis. As the record reveals, local area AVM services, such as those provided by AMTECH and others, need more than the 10 MHz provided for in the *NPRM* to meet the current and increasing demand for their advanced, high quality services.

The comments also substantiate that such sharing between wide-area and local-area systems is entirely feasible. While PacTel and MobileVision, wide-area licensees with fragile systems, have argued that such sharing cannot be accomplished, they have failed to prove their point. In contrast, a variety of commenters representing the AVM industry, including one wide-area system developer whose comments discuss various techniques by which its system can offer cost-effective, high-quality service in a shared environment, support sharing throughout the entire AVM allocation. Even PacTel, who has argued that sharing is not feasible, has submitted materials that suggest strongly that the compatibility of their system with local-area operations may be far greater than they have maintained. Further, in arguing against co-channel wide-area to

wide-area system sharing, PacTel identifies techniques that would effectively promote the co-existence of wide-area and local-area technologies. Thus, the Commission should not, as it has proposed, segregate the band into local-area and wide-area allocations for fear that wide-area systems would not be able to co-exist.

Such action is not only technically unnecessary, it would result in significant harm to the public interest by disrupting numerous ongoing operations by state and local transportation authorities and current research and development efforts.

In fact, the record overwhelmingly demonstrates that numerous public interest benefits would accrue from opening the entire band for AVM/LMS services, including the accommodation of the growing current and future demand for automatic toll collection, traffic management and intelligent vehicle highway systems ("IVHS"), rail monitoring, seamless tracking or intermodal transport and other important public and private applications. Because local-area systems require access to the entire band to continue to provide this plethora of public interest benefits that have already or are soon to be realized, the entire 26 MHz should be made available to local-area technologies.

AMTECH's alternative band plan would best meet the needs of all local-area and wide-area AVM/LMS systems. While predicated on sharing throughout the band

A number of commenters, proponents of amateur radio and Part 15 devices, have requested that the Commission reduce the amount of spectrum made available for LMS and AVM applications to less than the proposed 26 MHz. Neither Part 15 operations or fixed amateur operations would pose a potential interference threat to AMTECH's local-area technologies, and AMTECH does not believe that systems employing its technologies will cause debilitating interference to these operations. While the Commission should not adopt the proposals of these parties, it should not change the current regulatory status of amateur and Part 15 operations in the band.

Finally, the Commission should deny Radian Corporation's request to consolidate this docket with consideration of its petition for an allocation for wind profiler radar systems in the 902-928 MHz band. Such action would be totally unwarranted given that there is uncertain demand for non-governmental wind profiler systems at 915 MHz, and Radian has failed to provide sufficient information to demonstrate that its system, which suggests serious interference potential, would not threaten to interfere with many AVM systems. Instead of delaying the adoption of final AVM rules by concomitantly considering Radian's proposal, the Commission should expeditiously implement a sharing band plan for AVM systems, consistent with that proposed by AMTECH, to advance the numerous important public benefits offered by AVM that are already being enjoyed by substantial segments of the American

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**REPLY COMMENTS OF AMTECH CORPORATION**

AMTECH Corporation ("AMTECH"), by its attorneys, hereby replies to the comments filed in response to the Commission's Notice of Proposed Rulemaking ("NPRM") in the above-captioned proceeding.<sup>1</sup> The record developed thus far in the proceeding demonstrates strong support for making the entire 902-928 MHz band available to the Location and Monitoring Service ("LMS"), which includes automatic vehicle monitoring ("AVM") and other services, as proposed in the *NPRM*. Moreover, there is a strong basis for the Commission not to segregate the entire band between local-area and wide-area AVM/LMS systems.

The Commission proposed to segregate the band into wide-area and local-area AVM/LMS sub-bands upon the presumption, nurtured by the desires of certain wide-area AVM system licensees for exclusivity, that local-area and wide-area systems cannot co-exist. The record demonstrates, however, that the co-existence of co-channel

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<sup>1</sup> 8 F.C.C. Rcd 2502 (1993). An extension of time to file reply comments was granted on July 6, 1993. See Order Extending Reply Comment Period, DA 93-812 (July 7, 1993).

wide-area and local-area systems can be accomplished without undue difficulties and should be, removing the linchpin to the *NPRM*'s segregation plans. Accordingly, AMTECH respectfully submits that the alternative band plan presented in its initial comments,<sup>2</sup> Plan B, best accommodates the spectrum requirements for *all* currently known AVM/LMS applications while promoting competition and continued technological development.<sup>3</sup>

Further, the Commission should not alter the regulatory status of Part 15 devices and amateur radio operations, in this band or generally. At the same time, the FCC need not and should not limit the availability of the 920-928 MHz band for LMS and AVM operations in order to make special accommodations for secondary Part 15 users and amateurs.

Finally, the agency should not allow the request for a wind profiler allocation centered at 915 MHz to delay the full implementation of final AVM/LMS rules. There

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<sup>2</sup> Comments of AMTECH Corp., PR Docket No. 93-61 at 17-28 (filed June 29, 1993) ("Comments of AMTECH").

<sup>3</sup> AMTECH counter-proposed two band plans in response to the *NPRM*. Both contemplate sharing between wide-area and local-area systems throughout the band. AMTECH's preferred band plan, which it will call "Plan A" in this reply, provided for high-powered wide-area system forward links in the 902.000-902.250 MHz and 927.750-928.000 MHz sub-bands, and local-area system highway beacons in the 902-906 MHz and 924-928 MHz sub-bands. In the alternative, AMTECH proposed a band plan, here Plan B, which had "quiet zones" at 906-910 and 920-924 MHz in order to accommodate through compromise those wide-area systems, such as PacTel's and MobileVision's, which have been engineered to operate in a less noisy environment. In these 4 MHz quiet zones -- sized to match the spectrum utilized by the MobileVision and PacTel technologies (*see* Comments of MobileVision, L.P., PR Docket No. 93-61 at 30-31 (filed June 29, 1993) ("Comments of MobileVision")) -- local-area base stations would be required to operate at maximum effective radiated power over 20 dB down from the ceiling otherwise applicable in the band. Similarly, local-area mobile power limits would fall from 1 watt, generally to 50 mW in the quiet zones. Copies of Plan A and Plan B are attached hereto in Appendix A. AMTECH notes that PacTel has provided data indicating that its system would significantly benefit by these low power zones.



simply has been an inadequate showing that there is a need for non-governmental allocation for wind profiler radar systems. The sole private proponent of such systems at this frequency, Radian Corporation, continually has failed to acknowledge the potential interference posed by its proposed operations to AVM systems and to address the many concerns raised by many others in response to its allocation request. Any delay in the adoption of final AVM rules in order to resolve Radian's request could slow the growth of the AVM industry in all of its aspects and unnecessarily deprive the American public of the full benefits of current and future AVM technologies.

I. THE RECORD CONFIRMS THAT THE PUBLIC INTEREST WOULD BE SERVED BY MAKING THE ENTIRE 902-928 MHz BAND AVAILABLE TO ALL AVM AND LMS SYSTEMS ON A SHARED BASIS.

The central premise of the *NPRM*'s proposal to segregate the 902-928 MHz band into wide-area-only and local-area-only sub-bands is that wide-area and local-area operations cannot share spectrum. However, as the comments of North American Teletrac and Location Technologies, Inc. ("PacTel") and others demonstrate, suggestions that sharing between wide-area and local-area operations is not readily and practically attainable are unsound. Therefore, not only should the FCC allocate the entire 902-928 MHz band to AVM/LMS, as proposed in the *NPRM*,<sup>4</sup> but the Commission should give both local-area and wide-area systems access to the entire band on a shared basis.

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<sup>4</sup> 8 F.C.C. Rcd at 2504-05.

AMTECH proposed two band plans in its comments which contemplated such band-wide sharing. The second plan, Plan B,<sup>5</sup> was designed to accommodate those systems of PacTel and MobileVision that operate using 4 MHz of spectrum and that desire a lower noise floor, by adopting special sub-bands at 906-910 and 920-924 MHz in which local-area systems could operate on a co-primary basis, but at considerably lower power levels. In AMTECH's view, Plan B, of all the band plan variations advanced in the *NPRM* and in the comments, best serves the interests of all AVM system proponents, both wide-area and local-area, and the interest of the public. Plan B should be adopted.

A. The Record Demonstrates the Public Interest in Sharing  
Between Local-Area and Wide-Area Systems Throughout the  
Entire AVM Allocation.

In the *NPRM*, the Commission tentatively concluded that wide-area systems could not tolerate the presence of co-channel local-area operations. Its proposal to segregate the band, and lower the amount of spectrum available to local-area systems from 16 MHz to 10 MHz was based on that premise. Nonetheless, the FCC noted its expectation "that licensees dedicated to operating cooperatively in a shared environment would be able to propose a method by which productive co-channel operations can be achieved," and its openness to band plans other than the one it proposed.<sup>6</sup> Not only

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<sup>5</sup> See note 3, *supra*.

<sup>6</sup> *NPRM*, 8 F.C.C. Rcd at 2505.

were such plans proposed, but some of the firmest support for them was inadvertently provided by their ostensible detractors, reinforcing the validity of the plans.

AMTECH proposed that the entire band be shared by local-area and wide-area systems. As AMTECH explained in its comments, the incorporation of sharing into final AVM/LMS rules would facilitate the selection of appropriate frequencies and bandwidths by all AVM operators and promote continued innovation in AVM system design by removing artificial constraints on use of the band.<sup>7</sup> Such sharing is attainable and practical through various methods, as is demonstrated by a number of AVM system developers and users and, ironically, by the technical appendices to the PacTel submission in this docket.

Many members of the AVM industry directly support sharing throughout the entire AVM allocation. These include a number of state and government agencies that have invested significant amounts of money in the deployment of AVM systems<sup>8</sup> as well as a number of private industries with pivotal responsibilities for the movement of this nation's resources.<sup>9</sup> In addition, at least one wide-area system operator, Pinpoint

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<sup>7</sup> AMTECH Comments at 17-22.

<sup>8</sup> See, e.g., Comments of the Greater New Orleans Expressway Comm'n, PR Docket No. 93-61 at 1 (filed June 24, 1993) ("Comments of the Greater New Orleans Expressway Comm'n"); Comments of the N.J. Highway Auth., the N.J. Turnpike Auth., the N.Y. State Thruway Auth., the Pa. Turnpike Comm'n, the Port Auth. of N.Y. & N.J., the South Jersey Transp. Auth. and the Triborough Bridge & Tunnel Auth. ("IAG"), PR Docket No. 93-61 at 9 (filed June 29, 1993) ("Comments of the IAG").

<sup>9</sup> See, e.g., Comments of the Association of American Railroads ("AAR"), PR Docket No. 93-61 at 6-7 (filed June 29, 1993) ("Comments of AAR"); Comments of the American Trucking Ass'n, PR Docket No. 93-61 at 2 (filed June 29, 1993); Comments of the American President Co., PR Docket No. 93-61 at 2 (filed June 29, 1993) ("Comments of APC").

Communications,<sup>10</sup> and several local-area system developers,<sup>11</sup> believe that local-area and wide-area systems can co-exist and should be allowed to operate in the same spectrum.<sup>12</sup>

AMTECH's alternative band plan, as presented in its comments, supports sharing throughout the band. As a concession to those wide-area operators desiring to use less power and requiring 4 MHz or less of spectrum, i.e. PacTel,<sup>13</sup> Southwestern Bell Mobile Systems,<sup>14</sup> and MobileVision,<sup>15</sup> AMTECH proposed "quiet" zones for

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<sup>10</sup> Comments of Pinpoint Communications, Inc., PR Docket No. 93-61 at 9-10 (filed June 29, 1993) ("Comments of Pinpoint").

<sup>11</sup> See, e.g., Comments of American Tel. & Tel. co., PR Docket No. 93-61 at 8 (filed June 29, 1993) ("Comments of AT&T"); Comments of Mark IV IVHS Division, PR Docket No. 93-61 at 4 (filed June 29, 1993) ("Comments of Mark IV").

<sup>12</sup> Mark IV's proposal to allow secondary operation of local-area systems in the 904-912 and 918-926 MHz sub-bands evidences a realization by that developer that local-area and wide-area systems can

such systems in which local-area operations would be permitted at up to 28 dB lower power than in other parts of the band. AMTECH submits that this is a significant compromise to those that would seek to obtain exclusivity on the basis of "fragile" system design. The laws of physics provide that two co-channel signals can interfere with each other under some circumstances. The extent to which they do is a question of engineering, a matter of choices. PacTel has outlined in its comments how wide-area systems can be made more robust. Its failure to design its system in that fashion, while intending to operate in shared spectrum environment, should lead to the consequences that inevitably follow. The laws of physics offer an incentive for engineering of systems suited to their environment. While certain designs may be able only to operate in a pristine environment, the reluctance of designers to modify such systems to operate in spectrum that, to date, has been shared would disserve the public interest by constraining the most expansive use of the band.

The proponents of wide-area systems that demand a spectrum set aside for their type of systems have failed to demonstrate that adequately designed hyperbolic multilateration ("HML") systems cannot co-exist in spectrum shared with local-area operations. As noted above, one wide-area system developer, Pinpoint, acknowledges that HML systems can offer cost-effective, high-quality service in a shared environment

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<sup>15</sup>(...continued)

<sup>15</sup> Comments of MobileVision at 36-40. Although MobileVision continues to insist that 8 MHz is necessary for wideband operations, its comments reveal that two 2 MHz sidelobes, which could be suppressed, are superfluous to the 4 MHz central signal, which is all that is necessary for successful operation. It is noteworthy that MobileVision's comments tend to reflect the PacTel system more than its own, despite upbeat promises of future systems, suggesting that MobileVision has only a "paper system."

through various techniques. Pinpoint describes the effectiveness of the judicious placement of base stations so as to lessen the "black-out" areas that may exist surrounding local-area systems,<sup>16</sup> the use of higher power levels,<sup>17</sup> re-transmissions by mobile units, and the employment of energy filtering techniques.<sup>18</sup>

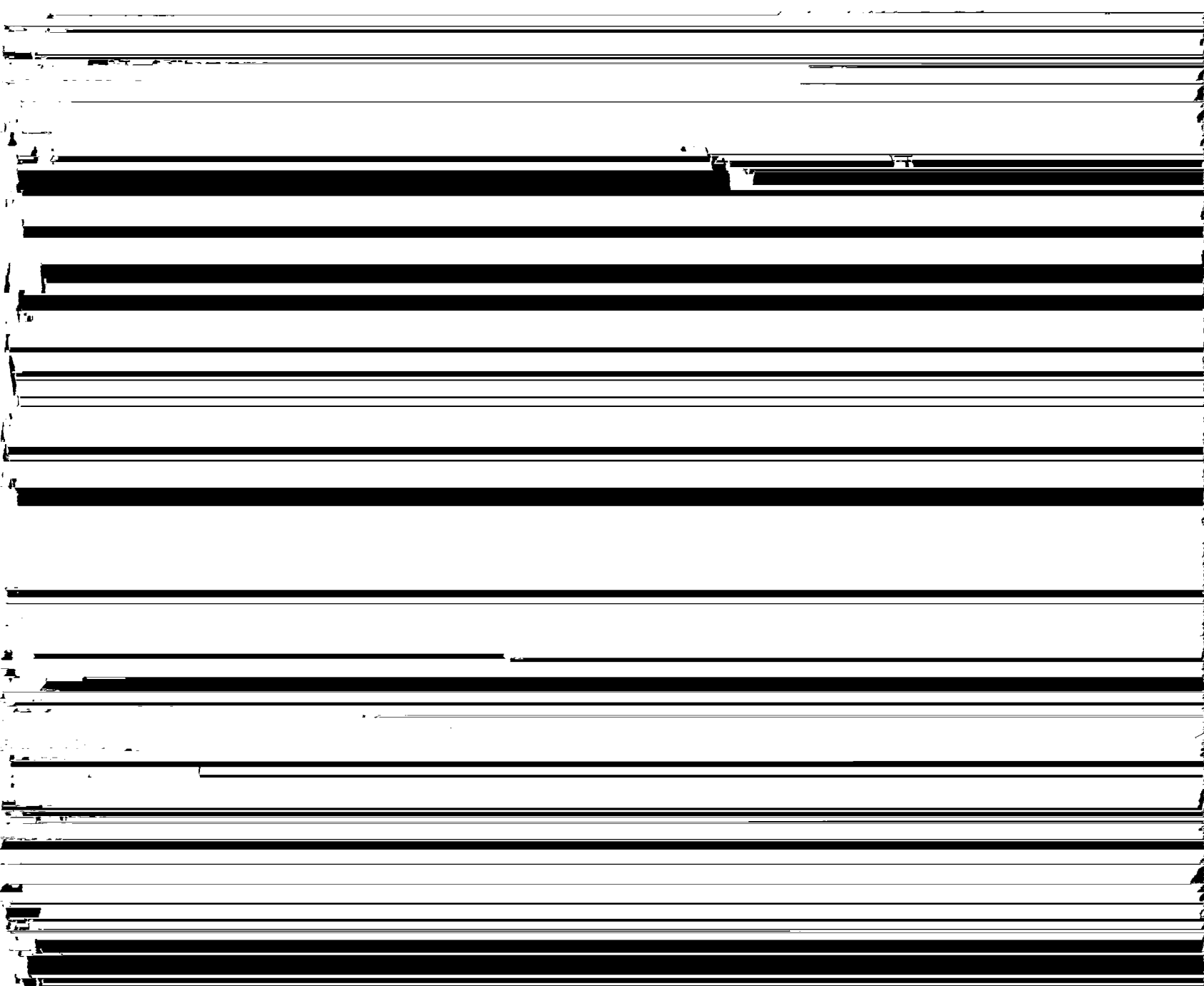
Close inspection of the comments of other wide-area system proponents, such as PacTel and MobileVision, do not support a finding that sharing cannot occur.<sup>19</sup> Indeed, PacTel itself has effectively, if inadvertently, conceded that a host of techniques exist that would allow the co-existence of wide-area and local-area technologies. Even more importantly, PacTel's field tests suggest that the "quiet zones" proposed by AMTECH in its Plan B would effectively alleviate much of the potential interference threat purportedly posed by local-area systems.

One of the chief complaints that PacTel has made since filing its Petition for Rulemaking is that a single local-area reader could prevent the receipt of its mobile's position-fixing pulses at a sufficient number of base stations to make an accurate



location measurement. PacTel and MobileVision have said this minimum number is generally agreed to be four.<sup>20</sup>

PacTel's own data prove that AMTECH's Plan B will largely accommodate the self-imposed needs of PacTel and MobileVision for a quieter RF environment designed to meet PacTel's need to receive its pulse signals at at least four sites.<sup>21</sup> These

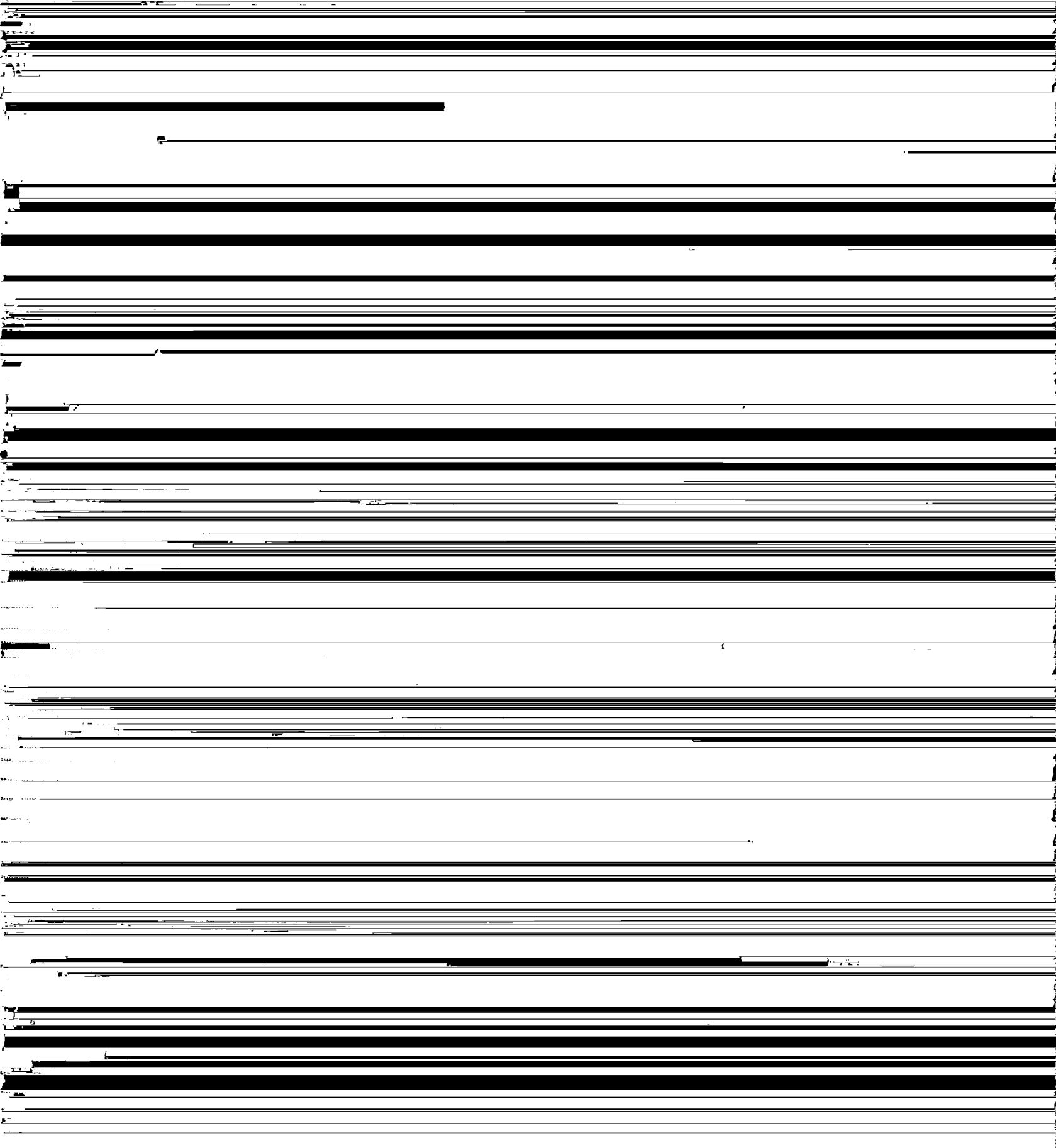


PacTel mobile unit in the test appears to transmit with an EIRP of  $-5\text{dBW}$  although actual EIRP of PacTel mobile units varies with antenna type.<sup>23</sup>

According to the data summarized in Figure 9, only five receive sites were able to receive the PacTel mobile's wideband pulse signal when the wideband interferer was



Number of Responded Sites as a Function of Interference



local-area signals.<sup>26</sup> Interestingly, as described below, PacTel's demonstrations are found in its discussion as to why simultaneous co-channel operation by wide-area systems is not possible.

PacTel chides the Commission for assuming that sharing of the 902-928 MHz band among wide-area systems is feasible after tentatively concluding that sharing between wide-area and local-area systems may be impractical. PacTel asserts that "[a] wideband pulse-ranging interfering signal raises the same interference concerns as an ensemble of narrowband systems spread across a wideband channel."<sup>27</sup> PacTel then describes a number of ways that a wide-area system, at least temporarily, can counter the interference from a new co-located, co-channel wide-area competitor.

Without commenting on PacTel's conclusions on the feasibility of co-channel sharing by wide-area systems, it follows from PacTel's reasoning that local-area systems raise similar interference concerns as do wideband pulse-ranging wide-area system signals, albeit often on a smaller scale, because of lower power and bandwidth.<sup>28</sup> Accordingly, techniques to alleviate co-channel interference from a

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<sup>26</sup> PacTel has admitted on several earlier occasions that at least some filtering of narrow-band emissions is possible. See, e.g., Affidavit of Dr. Charles L. Jackson at ¶ 23 (dated Apr. 6, 1993) (attached to PacTel's Application For Freeze, PR Docket No. 93-61, RM-8013, att. B (filed May 21, 1993)).

<sup>27</sup> Comments of PacTel at 24-25.

<sup>28</sup> While the spectrum demands of local-area systems are often several megahertz, narrowband local-area systems do not always cover as much contiguous spectrum as a broadband wide-area signal. In AMTECH's case, the signals of a "read only" reader are continuous-wave narrowband, typically with an authorized bandwidth of 20 kHz. The reader frequencies are separated by about 1 MHz or more because the tag reflections are several hundred kHz wide. The power levels of local-area systems, (continued...)

second wide-area system should apply with even more force to possible interference caused by a local-area system. The critical difference is that local-area systems, because of their robustness vis-a-vis wide-area operations, would not have to "retaliate" against palliative measures taken by a wide-area system. As a result, the "tragedy of the commons" outcome, repeatedly cited by PacTel with respect to sharing among wide-area systems, does not arise between local-area and wide-area systems. Steps implemented to counter the potential interference from a local-area system are *permanently* effective.

First, PacTel notes that "a pulse-ranging system could transmit higher power signals to overcome interference."<sup>29</sup> Indeed, PacTel's own licenses reflect its request for 50 W output (158 W ERP) in its mobiles suggesting that PacTel once had in mind a more robust system. In reality, its mobiles effectively operate at about 17 dB to 22 dB *below* their authorized limit, greatly increasing the susceptibility of mobile system transmissions to interference from the many users in the shared 902-928 MHz band.<sup>30</sup>

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<sup>28</sup>(...continued)

whether wideband or narrowband, are much lower than that of a wide-area system and the antennas are typically canted downward. In fact, the wideband modulated backscatter signals from tags are on the order of 40 dB below the already low-power of the illuminating signal and have never been alleged as a source of interference.

<sup>29</sup> Comments of PacTel at 31.

<sup>30</sup> Professor Pickholtz asserts the costliness of replacing the systems in the field with more powerful radios. Pickholtz Study at 35. PacTel provides no quantitative measure of this cost, but AMTECH notes that PacTel apparently has only several thousand subscribers in its six cities, reducing the burden of replacement. Moreover, replacement with higher power radios would only be needed in a given market at the time potentially interfering local-area systems were installed. Similarly, PacTel fails to explain how the cost of the radios will increase at higher power levels. In fact, a wider bandwidth (and shorter pulses) might improve the cost effectiveness of the radios. See Pinpoint Comments at 28.

Appendix 2 to the PacTel comments convincingly illustrates how use of realistic power levels in the PacTel mobile units would eliminate virtually completely the interference from local area systems. Figure 9 in that Appendix shows that a 10 dB decrease in the relative power of the interfering signal will yield a dramatic improvement in the number of usable receive sites (e.g. from 5 sites at 1 watt to 11 sites at 100 mw. The same degree of improvement should be achievable by a 10 dB increase in the transmit power of the mobile unit. Accordingly, use of relatively low base station power for local area systems should be compatible with wide-area systems that are engineered to operate in a relatively noisy shared band.<sup>31</sup>

Second, PacTel observes that the "bandwidth [of wide-area systems] could be increased."<sup>32</sup> Professor Pickholtz observes that doubling the bandwidth cancels out a fourfold increase in noise power.<sup>33</sup> Under AMTECH's Plan B, spectrum is available to wide-area systems that would permit an increase in bandwidth for a system using 4 MHz by more than six times, which would cancel out over a *thirty-six-fold* increase in power, a 15 dB difference. Moreover, by increasing the bandwidth, a wide-area

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<sup>31</sup> AMTECH has proposed use of up to 30 watts ERP at 10 meters height in the 902 - 928 MHz band for most local systems. It is important to recognize however that unlike wide area systems, local area systems typically use directional antennas and would likely employ transmit power substantially less than 30 watts. Moreover, local area systems usually have little interest in directing power toward an unobstructed horizon. Rather, it is typically directed downward or toward a large target (e.g., a rail car) so that the reflected power is not concentrated in a beam that manifests the same power as the incident signal. Instead, the signal reflected off of cars and the pavement tends to be scattered at a distance away from the transmitting antenna and thus appears more like a signal that would have been produced without transmitter antenna gain.

<sup>32</sup> Comments of PacTel at 32.

<sup>33</sup> Pickholtz Study at 37.

system would lower the pulse duration needed to establish a position fix,<sup>34</sup> and further minimize the likelihood of interference from the intermittent signals presented by a local-area system.<sup>35</sup>

Third, PacTel explains that "more receive sites may alleviate interference."<sup>36</sup>

In the case of a particular local-area system, a single additional receive site may

Thus, the cost increase associated with co-existence with a local-area system would be much smaller than the scenario posed by Dr. Pickholtz.

As the above discussion shows, PacTel has identified measures that could effectively reduce the interference effects of local-area systems by as much as 30 dB or more. This level of improvement does not even take into account the potential for filtering out narrowband local-area systems, which PacTel has also admitted is a possibility. More importantly, under the AMTECH plan, the potential for interference to the PacTel and MobileVision systems is lower still, to the point where the effect is minimal even absent other protective measures, as PacTel's own analysis convincingly demonstrates. Thus, the Commission need not segregate the band into local-area and wide-area allocations out of fear that wide-area systems would not be able to co-exist. Nor should they. As the demand grows for technologies to meet current and future demand for toll collection, traffic management, rail monitoring, seamless tracking of intermodal transport and other important public and private applications, local-area systems will require access to the entire band.

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<sup>39</sup>(...continued)

adequate number of receive sites. Similarly, MobileVision's Comments suggest that base-station receivers will either be separated by approximately twenty miles or will be typically extremely concentrated at a central location. Comments of MobileVision at 21 n.16.

B. The Record Supports Sharing Throughout the Entire Band in Light of the Spectrum Requirements of Important and Non-Substitutable Local-Area AVM Applications.

The existing uses to which local-area systems are being put clearly demonstrates the need for more local-area spectrum than proposed in the *NPRM*'s segregative allocation. Indeed, some traffic management applications in the most congested areas of the country underscore the need for local-area access to the entire 26 MHz band.

1. Local-area systems are serving myriad important public and business uses.

Not only may sharing between local-area and wide-area systems occur, it should take place throughout the 902-928 MHz band. The reason is that local-area systems are being used by hundreds of thousands of customers and that number is increasing daily. The resulting demand necessitates access to be the entire band.

As AMTECH explained in its comments, its local-area system technologies are being deployed to provide important public benefits: automatic toll collection, traffic management and intelligent vehicle highway systems ("IVHS"), railroads, interstate trucking, intermodal shipping (*i.e.*, ship, rail, truck, air), and the air transport industry, to cite the principal examples.<sup>40</sup> The comments submitted in response to the *NPRM* resoundingly confirm the importance of these local-area technology applications, many

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<sup>40</sup> Comments of AMTECH, app. A.

of which have been implemented, serving hundreds of thousands of users today. Many more local-area systems are in the planning stages.

Numerous state and local agencies that are using or intend to use the local-area

and the following information is being provided for the entire 000 000



the societal benefits of short-range, two-way, roadway to vehicle communications as typified by the current electronic toll collection projects."<sup>43</sup>

Another commenter, the IAG, a group of seven transportation, toll road, bridge and tunnel authorities in the heavily populated states of New York, Pennsylvania, and New Jersey supports access to the entire band for local-area systems. These agencies account for 40 percent of all toll transactions and two-thirds of all toll revenues collected in the United States, amounting to over 1.4 billion dollars per year.<sup>44</sup> These governmental bodies have joined to implement the E-Z Pass Plan, a coordinated toll collection plan utilizing local-area technology that has the potential to serve over one million users in the tri-state region.

Also supporting the opening of the entire band to local-area systems is the American Association of Railroads, which is in the midst of implementing nationwide local-area installations along the nation's railroads using AMTECH's modulated backscatter technology. This system will provide tracking and monitoring of virtually all 1.4 million rail cars in North America, improving the efficiency of our nation's rail lines.<sup>45</sup> At present, over a third of the railcars have been equipped with tags.

